Gmelina arborea

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Gmelina arborea Roxb.

Taxonomy and nomenclature

Family: Verbenaceae
Synonyms: None
Vernacular/common names: jati putih (Indonesia); gamari, gumadi (India); gamhar (Bangladesh); yamane (Myanmar); white teak (Eng.).

Distribution and habitat

The area of natural distribution includes Nepal, India, Pakistan, Bangladesh, Sri Lanka, Myanmar, Thailand, Laos, Cambodia, Vietnam and Southern China. In the natural forest, the species is usually found scattered and in association with other species. It is found in evergreen forests in Myanmar and Bangladesh and in relatively dry mixed deciduous forest types in Central India.

It has been introduced as a plantation species in many countries, and large plantations are found in South-East Asia, West Africa and South America.

Uses

The wood is used mainly for light construction and for pulp. Several parts of the tree are used for medicine and the leaves are used for cattle fodder.

It is used in enrichment planting on cocoa farms to fill in gaps in the canopy due to its fast growing nature. Cuttings and seedlings are planted as shade for young and old cocoa trees.

1, Tree habit; 2, flowerĀing twig; 3, flower; 4, fruits. (Soerianegara and Lemmens, 1993)

Botanical description

A medium-sized tree up to 30 (-40) m tall; bole with average diameter 50 cm but sometimes reaching 140 cm. The bark is smooth or scaly, pale brown to grey. The twigs are glabrous or pubescent. Flowers of bright yellow colour, arranged in large, terminal panicles (30-350 flowers in each). Leaves are opposite and usually more or less heart-shaped, 10-25 cm x 5-18 cm. The flower is large, up to 4 cm long, perfect, with an irregular 5-lobed tubular corolla.

Fruit and seed description

Fruit: the fruit is a succulent drupe, 20-35 mm long, with a shiny, leathery skin and a sweet, pulpy mesocarp. The stone (endocarp) is 10-25 mm long, with one round and one pointed end. The stone normally contains four seed chambers, in rare cases five.
Seed: one or more of the chambers contain seed but there are rarely more than two filled seeds per fruit. The size of the seed increases with stone size, e.g. from 6 to 9 mm in length.

The weight of 1000 stones is approximately 400 g.

Flowering and fruiting habit

Gmelina flowers and fruits every year. In the natural distribution area with a seasonal climate, flowering starts in the dry season when trees are leafless. In seasonal climates outside the natural distribution there is no distinct flowering and fruiting period, and flowers and fruits can be seen more or less throughout the year. The fruit matures 1½ month after flowering. The species is predominantely outcrossing and the flowers are pollinated by large bees.

Harvest

Fruits are picked from the ground. The mature fruits may fall from the tree while they are still green. Green fruits turn yellow within a week and after about two weeks from falling, they turn brown and after about three weeks black. It is best to collect the fruits when they are still green or yellow, as germination capacity of brown and especially black fruits is low.

As all fruits do not fall and mature at the same time, fruits should be collected frequently, e.g. twice every week during the collection period, that may stretch over several months. Cleaning of shrubs and weeds from the forest floor is recommended to ease seed collection. ProducĀtion of fruits varies with age of stand,

ecological conditions and stand conditions. There are reports of seed production from 30 kg cleaned stones/ha/year to around 170 kg/ha/year.

Processing and handling

Transport of fruits to the processing site should be in open baskets or nets, not in plastic bags. In order to avoid fermentaĀtion, fruits should be brought to the cleaning area within 24 hours. This is especially important for fully ripe – i.e. yellow and brown – fruits. As much care as possible should be taken to avoid damage to the fruits, since fermentation is more likely to start among damaged fruits.

At the processing site, the fruits should be sorted into those that are ready for immediate processing (yellow and brown colour) and green and green-yellow fruits, which will benefit from after-ripening. After-ripening is done in the shade by spreading the fruits in a 10-15 cm thick layer until they have turned yellow. This may take up to one week.

Depulping of small quantities of fruits can be done manually by mashing the fruits until the pulp is loose from the stone, and rinsing with water. For larger quantities of fruits depulping is normally done in a coffee-depulper. Soaking the fruits in water for 24 hours before depulping will facilitate the process. After depulping, the fruits are spread out on a wire-mesh tray and rinsed with water to remove juice and pulp.

Normally traces of pulp will remain on the stones after depulping and further cleaning or polishing of the stones is required. This can be done either manually by rubbing the stones with sand and water or mechanically (also with sand) in a concrete mixer.

Finally the stones are washed and dried well in the sun.

Seed storage

Fruits, which have been dried down to a moisture content of 5-8 % and kept below this moisture content in cold storage (4-5 °C), can be stored for several years without reduction in viability. It is however difficult to sun dry the stones below 10 % moisture content, so additional drying in an oven (35-50 °C) may be required for long term storage. If seeds are sown within a year from processing, sun drying and storage in airtight containers is sufficient.

Rodents may cause severe losses in stored stones. Storing in metal containers prevents such losses.

Dormancy and pretreatment

The seeds have no dormancy, and no pretreatment is required. Soaking of the seed in cold water for 24-48 hours before sowing is recommended.

Sowing and germination

The seeds (stones) are sown in a seedbed of soil or sand, covered by a thin layer of sand or soil. The germination of Gmelina seed is epigeous with the radicle emerging first and the cotyledons shortly after. Depending on the position of the first germinating seed, the stone may be left in the ground or be pushed up, and the conditions for possible remaining seed to germinate may thus be more or less favourable.

Seeds normally germinate quickly and at high levels. Often the germination will be above 100% as more than one seed will germinate from each stone. The optimal temperature for germination is about 30°C, lower temperature will reduce germination. The seedbed should be exposed to full sunlight as partly or full shade will reduce germination. After germinaĀtion, the seedlings can be transplanted to containers.

Selected readings

Lauridsen, E.B. 1986. *Seed Leaflet No. 6. June 1986. Gmelina arborea, Linn*. Danida Forest Seed Centre, Humlebaek, Denmark

Soerianegara, I. and R.H.M.J. Lemmens (eds). 1993. *Plant Resources of South-East Asia No. 5(1). Timber trees: major commercial timbers*. Wageningen, Netherlands: Pudoc Scientific Publishers. Also published by Prosea Foundation, Bogor, Indonesia.

18-year-old *Gmelina arborea* of good quality. Nimbia, Nigeria. Photo: Henrik Keiding, DFSC

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